

U.S.S.N. 10,798,959

Claim Amendments

Please amend claims 25 and 41 as follows:

Please cancel claims 27 as follows:

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Listing of Claims

Claims 1-24 cancelled

25. (currently amended) An MIM capacitor structure comprising a protection layer to prevent interdiffusion of electrode metal and capacitor dielectric material:

a bottom non-oxide conductive electrode comprising said metal;

a first protection layer comprising silicon rich oxide (SRO) on the bottom conductive electrode, said SRO having a relatively higher silicon content compared to stoichiometric SiO₂;

a dielectric layer comprising silicon oxide on the first protection layer; and,

an upper non-oxide conductive electrode on the dielectric layer comprising said metal.

26. (original) The MIM capacitor structure of claim 25, further

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comprising a second protection layer disposed between the dielectric layer and the upper conductive electrode.

27. (canceled)

28. (original) The MIM capacitor structure of claim 26, wherein the second protection layer comprises a silicon rich oxide (SRO) having a relatively higher silicon content compared to stoichiometric SiO_2 .

29. (original) The MIM capacitor structure of claim 25, wherein an uppermost portion of the bottom and upper conductive electrodes comprise a material selected from the group consisting of Ta, TaN, and TaSiN.

30. (original) The MIM capacitor structure of claim 25, wherein the dielectric layer comprises PECVD silicon oxide.

31. (original) The MIM capacitor structure of claim 25, wherein the first protection layer is formed having a thickness between about 25 Angstroms and about 200 Angstroms.

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32. (original) The MIM capacitor structure of claim 26, wherein the second protection layer is formed having a thickness between about 25 Angstroms and about 200 Angstroms.

33. (original) The MIM capacitor structure of claim 25, wherein the upper and bottom conductive electrodes comprise a metal selected from the group consisting of aluminum, copper, tantalum, tungsten, titanium, and alloys thereof.

34. (previously presented) An MIM capacitor structure to prevent interdiffusion of electrode metal and capacitor dielectric material to achieve a stable capacitance comprising:

a bottom non-oxide conductive electrode comprising tantalum;

a bottom protection layer comprising silicon rich oxide (SRO) on said bottom conductive electrode;

a dielectric layer comprising an oxide on the bottom conductive electrode;

a top protection layer comprising silicon rich oxide (SRO)

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on the dielectric layer; and,

an upper non-oxide conductive electrode comprising tantalum on the top protection layer.

35. (canceled)

36. (previously presented) The MIM capacitor structure of claim 34, wherein the top protection layer comprises the silicon rich oxide (SRO) having a relatively higher silicon content compared to stoichiometric SiO_2 .

37. (previously presented) The MIM capacitor structure of claim 34, wherein the bottom protection layer comprises the silicon rich oxide (SRO) having a relatively higher silicon content compared to stoichiometric SiO_2 .

38. (original) The MIM capacitor structure of claim 34, wherein an uppermost portion of the upper and bottom conductive electrodes comprise a material selected from the group consisting of Ta, TaN, and TaSiN.

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39. (previously presented) The MIM capacitor structure of claim 34, wherein the dielectric layer comprises silicon oxide.

40. (original) The MIM capacitor structure of claim 34, wherein the top protection layer is formed having a thickness between about 25 Angstroms and about 200 Angstroms.

41. (currently amended) The MIM capacitor structure of claim 34 ~~[[35]]~~, wherein the bottom protection layer is formed having a thickness between about 25 Angstroms and about 200 Angstroms.

42. (original) The MIM capacitor structure of claim 34, wherein the upper and bottom conductive electrodes comprise a metal selected from the group consisting of aluminum, copper, tantalum, tungsten, titanium, and alloys thereof.

43. (previously presented) The MIM capacitor structure of claim 25, wherein the first protection layer has a higher density including refractive index compared to the dielectric.

44. (previously presented) The MIM capacitor structure of claim 26, wherein the second protection layer has a higher density

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including refractive index compared to the dielectric.

45. (previously presented) The MIM capacitor structure of claim 25, wherein the first protection layer comprises a nitrogen containing silicon rich oxide (SRO) having a relatively higher silicon content compared to stoichiometric SiO_2 .

46. (previously presented) The MIM capacitor structure of claim 26, wherein the second protection layer comprise a nitrogen containing silicon rich oxide (SRO) having a relatively higher silicon content compared to stoichiometric SiO_2 .

47. (previously presented) The MIM capacitor structure of claim 26, wherein the bottom electrode and first protection layer have a wider dimension compared to the upper electrode and second protection layer.

48. (previously presented) The MIM capacitor structure of claim 34, wherein the bottom and top protection layers have a higher density including refractive index compared to the dielectric.

49. (previously presented) The MIM capacitor structure of claim 34, wherein the bottom electrode and bottom protection layer have

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a wider dimension compared to the top electrode and top protection layers.

50. (previously presented) The MIM capacitor structure of claim 34, wherein the bottom and top protection layers comprise a nitrogen containing silicon rich oxide (SRO) having a relatively higher silicon content compared to stoichiometric SiO_2 .

51. (previously presented) An MIM capacitor structure to prevent interdiffusion of electrode metal and capacitor dielectric material to achieve a stable capacitance comprising:

a bottom conductive electrode comprising said metal;

a bottom protection layer comprising nitrogen containing silicon rich oxide (SRO) on said bottom conductive electrode;

a dielectric layer on the bottom conductive electrode;

a top protection layer comprising nitrogen containing silicon rich oxide (SRO) on the dielectric layer; and,

an upper conductive electrode on the top protection layer

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comprising said metal.

52. (previously presented) The MIM capacitor structure of claim 51, wherein an uppermost portion of the upper and bottom conductive electrodes comprise a material selected from the group consisting of Ta, TaN, and TaSiN.

53. (previously presented) The MIM capacitor structure of claim 51, wherein the dielectric layer comprises silicon oxide.

54. (previously presented) The MIM capacitor structure of claim 51, wherein the top protection layer is formed having a thickness between about 25 Angstroms and about 200 Angstroms.

55. (previously presented) The MIM capacitor structure of claim 51, wherein the bottom protection layer is formed having a thickness between about 25 Angstroms and about 200 Angstroms.

56. (previously presented) The MIM capacitor structure of claim 51, wherein the upper and bottom conductive electrodes further comprise a metal selected from the group consisting of aluminum, copper, tantalum, tungsten, titanium, and alloys thereof.

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57. (previously presented) The MIM capacitor structure of claim 51, wherein the bottom and top protection layers have a higher density including refractive index compared to the dielectric.

58. (previously presented) The MIM capacitor structure of claim 51, wherein the bottom electrode and bottom protection layer have a wider dimension compared to the top electrode and top protection layers.